PHILIPS

Sensors

EasySense

SNH21x MC

Design-in Guide

Single, **cost-effective luminaire control**

Philips EasySense SNH21x MC

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Introduction

EasySense SNH21x

This document is provides necessary information to design this product into a luminaire and configure it to suit specific applications. This design-in guide covers sensor functionality, mechanical mounting, wiring details, application notes and frequently asked questions.

For sensor datasheet specifications, additional information and/or support, please consult your local Philips sales representative or visit the following site: www.philips.com/easysense

Warnings and Instructions

- The EasySense SNH21x MC is a Sensor Ready (SR) industry sensor and therefore must be used together with a Philips Xitanium SR LED driver or Xitanium SR Bridge.
- Do not apply mains power directly to the sensor.
- Do not cover the sensor during operation or mount the sensor recessed.
- External infrared sources can have a negative impact on occupancy detection.
- Ensure that the sensor area defined for occupancy detection is not blocked by any obstacles. Misalignment of sensor might influence occupancy detection and daylight regulation.
- Make sure that the sensor, especially the occupancy detection lens, is not damaged during shipment and handling.
- The EasySense sensor application area is an indoor industrial environment - such as warehouses, assembly sites, or cold storage area. Such application areas should be normally ventilated. The EasySense sensors have no protection against aggresive chemicals.
- Make sure the EasySense sensor Zigbee/Bluetooth antenna is not covered by metal for proper RF communication.

EasySense Introduction

EasySense SNH21x MC

The EasySense SNH21x MC is the ideal solution for per-luminaire control of smart luminaires. It combines occupancy sensing, daylight harvesting and task tuning in a single package for easy OEM luminaire assembly.

These sensors operate with the established D4i open standard digital interface to make a simple two-wire connection between sensor and driver, thus eliminating the need for multiple components and auxiliary devices. The result is a cost-effective and easy-to-design-in solution ideal for energy-savings. An intuitive app called Philips MasterConnect allows for quick and easy commissioning via Bluetooth along with configuration during and after installation.

The SNH21x MC allows luminaires to be grouped with each other for occupancy sharing (i.e., luminaires within a group can be programmed to remain at prescribed light levels so long as occupancy is detected anywhere in the group) and daylight depending light regulation.

All the features are described in detail in the subsequent sections.

Product Characteristics

EasySense SNH21x MC contains multiple functions in one housing and uses two wires to connect with an SR driver. The following image shows the primary functions included in the sensor:

environment (warehouses, assembly areas, cold stoarge areas, etc.) in normally ventilated areas, the temperature range being -30°C to 65°C. EasySense SNH21x MC has no protection against aggressive chemicals. The sensor is normally mounted to a luminaire and can go up to mounting height of 16m.

Zigbee and Bluetooth Low Energy (BLE)

The RF antenna allows luminaire to luminaire wirless communication via IEEE 802.15.4 wirless protocol with radio frequency: 2400-2483.5MHz. The antenna area as shown above (also in Figure 12) should not be covered by metal and should be exposed to free air to ensure there is sufficient range.

Product Characteristics (continued)

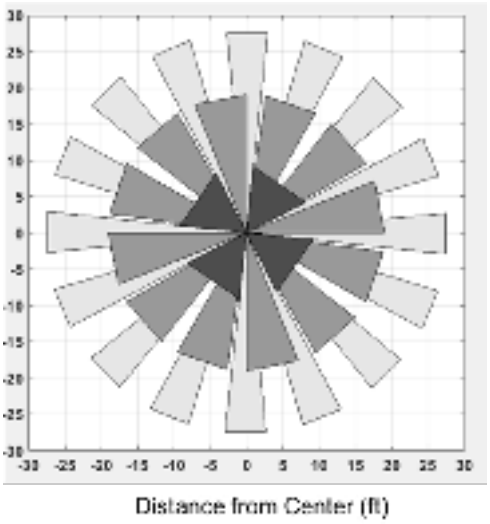

Figure 1 - Top coverage pattern of EasySense SNH211MC.

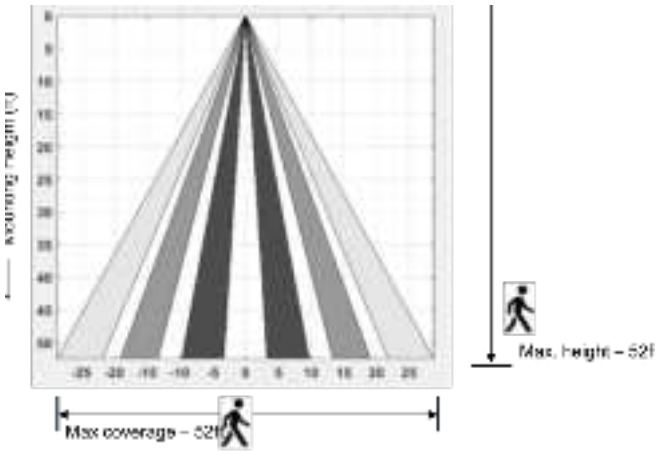

Figure 2 - Side coverage pattern of EasySense SNH211MC at height of 16m.

Motion Detector

The occupancy sensor is a PIR (Passive Infrared) sensor that detects movement with a circular cross-area under an angle of X = 30° and Y = 30°. This PIR sensor has 3 concentric rings to help detect movement - the innermost with 4 facets, the middle with 12 facets and the outermost with 16 facets.

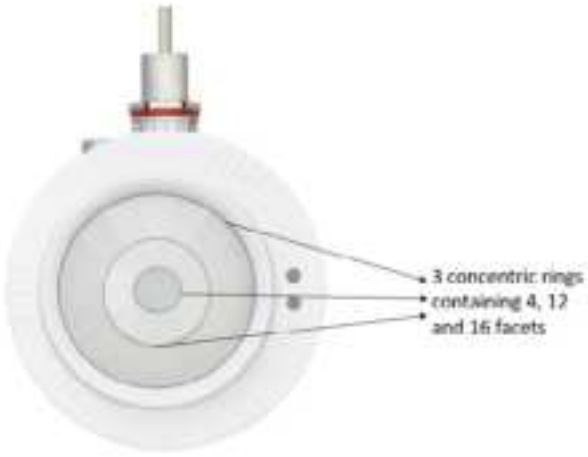

Figure 1 and Figure 2 show the top and side view of the occupancy coverage based on NEMA test, an industry standard.
In the side view, it is visible that coverage ratio of mounting height: diameter at ground level is at maximum 1:1. For example, if the mounting height is 12m, the maximum diameter coverege is 12m.

Disclaimer:

1. In these plots, the white areas are blind spots and the detection is based on subject's motion. An idle subject may not continue to trigger occupancy detection once the hold time expires.
2. As PIR based sensing works on temperature difference between the subject and the ground level, the occupancy detection could vary due to clothing and size of subject.

Product Characteristics (continued)

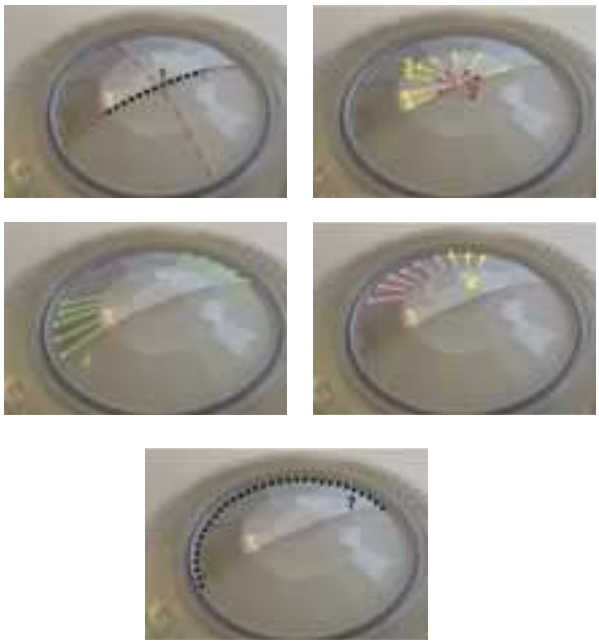

Figure 3 - Placement of light shield.

Lens Shield

An adhesive shield (half circle) is available with the product to minimize the occupancy coverage. To work with the shield, first determine the area on PIR lens that you would like to cover with the lens shield. Cut the shield, if needed.

Remove the carrier and align the center of the shield with the center point of the lens. To minimize air bubbles, only the black dotted line must contact the PIR lens. (1) Start sticking from center and then move outwards; follow the sequence as shown by red, (2) yellow, (3) green, (4) pink, (5) and yellow, (6) arrows. Finally, rub the outer edge of the shield according the black dotted line (7).

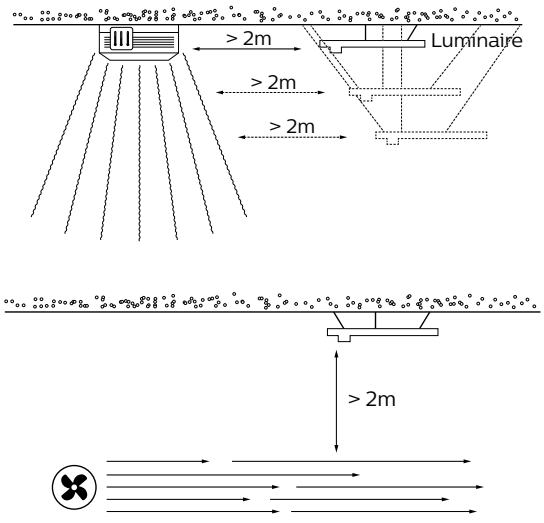

Figure 4 - Required distances to air vents.

Warning:

To avoid false triggers, place heat radiating devices outside of the monitoring cone and avoid drafts (e.g. from ventilators or heating systems).
EasySense SNH21x MC with motion detector enabled must be mounted more than 2 meters away from air vents in all directions, see figures on the left.

Product Characteristics (continued)

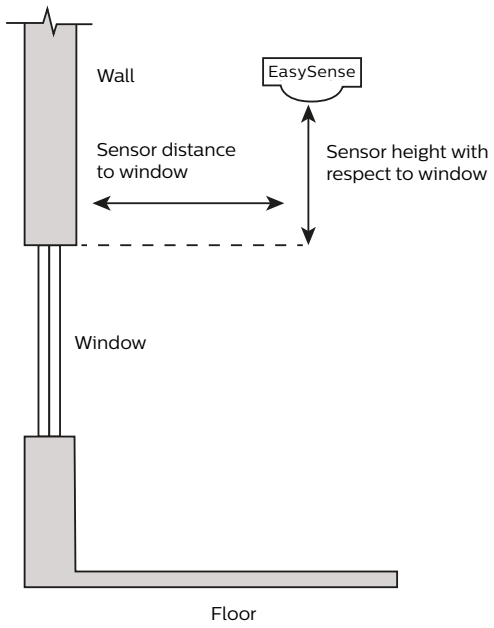

Figure 5 - Sensor placement.

Light Sensor

The light sensor measures the total amount of light with an opening angle of 10° whereas PIR has 27°, all calculated from normal. The following aspects should be observed during installation:

- Minimum distance from the window - refer below graph
- Prevent light reflection from outside entering the sensor (for example sunlight reflection from a car/truck bonnet) as this will lead to incorrect light regulation.

As a guideline the formula 0.174 x H can be used to calculate the minimum distance between the window and sensor whereby H is the height measured from the bottom of the window to the sensor.

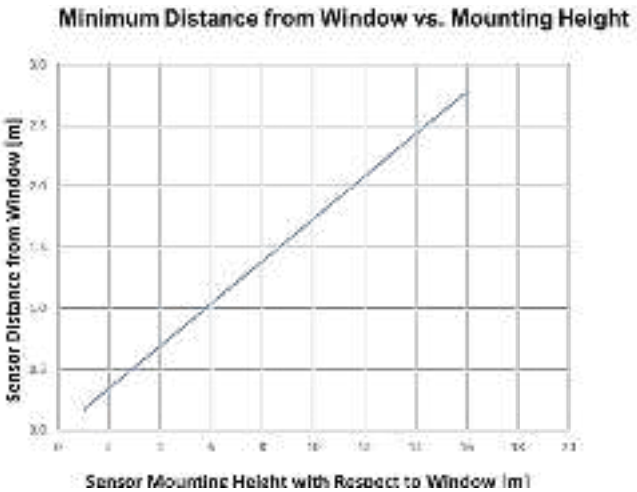
Minimum Distance from Window vs. Mounting Height
Sensor Distance from Window (m)
Sensor Mounting Height with Respect to Window (m)

Figure 6 - Sensor horizontal distance from window vs. vertical sensor mounting height from window sill.

Luminaire light that directly hits the sensor (like in figure 7) can compromise its function. Therefore the EasySense sensor should be placed outside of the light cone emitted by the luminaire.

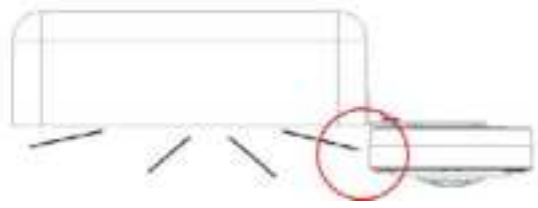

Figure 7 - Luminaire light hitting the sensor.

Daylight Regulation and Calibration

When daylight-based light regulation is enabled, the light output of a luminaires is dimmed in the presence of daylight. For full control of light levels in the working area it is recommended to calibrate the lighting in the application.

Daylight Regulation Without Calibration

When daylight-based control is switched on and no calibration is performed, the light output approximately to 150 lux times the value set for the Eco-on level. If the Eco-on level os set to 80% for example, the light output from the luminaire adjusts to approximately 120 lux in the working area.
The sensor does not read lux levels in the working area directly but measures the amount of reflected light that it captures. In the presence of daylight the sensor keeps the detected level constant by adjusting the light output of the luminaire.
The reflective properties of the surfaces in the field of view of the sensor, e.g. light or dark floors, impact the amount of light that is directed towards the sensor and consequently influence the luminaires light ouput and actual lux levels in the working area.
In case the reflective properties of objects below the luminaires of a room vary, the luminaires can show different light output, even in absence of daylight. Luminaires above dark surface areas emit more light than those above light areas.

Daylight Regulation With Calibration

Any time after configuration a calibration routine can be initiated. When the calibration routine is run the light level adjusts to the full light output (given by the operating current of the luminaire) times the percentage value set for the Eco-on level.
In a dark environment all luminaires configured with the same Eco-on level show the same light output, independent of the reflective properties of surfaces below the luminaires.
The individual sensors store the dark reading of the daylight sensor and keep the value constant in the presence of daylight by adjusting the light output of the luminaires.
All luminaires react individually on the amount of daylight in the field of view of their sensor.

How To Set The Light Level:

- Disable daylight regulation in the MasterConnect App.
- In a dark environment adjust the output current of the luminaire and the Eco-on value for the required lux value in the working area. It is recommended to measure the value with a lux meter.
- Place the smartphone at the center of the working area. Enable daylight regulation in the app again and press "Calibrate Daylight Sensor." Leave the room.
- To calibrate, the light output of the luminaires first goes to a low level and to a high level before it regulates to the set light level.

Warning:

Make sure no objects are blocking the sensor's view and no surface reflection changes occur in the sensor's view during calibration. For example, do not position a forklift truck in the sensor view area during calibration.

Mechanical Design-in

EasySense for High Bay is intended to be mounted to a standard 1/2" knockout available on the luminaire itself or a junction box. A washer and locknut are included with the sensor for this purpose. An OEM can develop custom brackets to attach to the top surface of the sensor in case the sensor needs to be mounted to a curved/non-flat surface. Mounting screws are provided with the sensor for this purpose. These screws are matched to the thickness of the plastic sensor housing. In case other screws are used, ensure that they do not protrude through the sensor plastics. Also make sure that the view of the sensor is not blocked anywhere by the luminaire or the bracket to avoid loss of functionality.

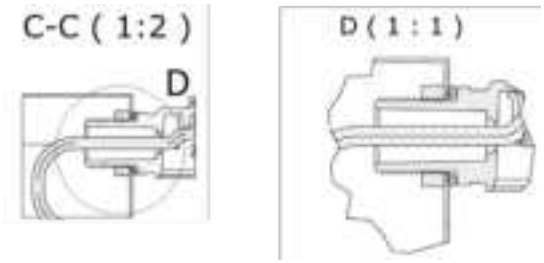

Figure 8 - Assembling sensor onto a knockout.

Mechanical Design-in (continued)

Figure 9 - EasySense RF Antenna position

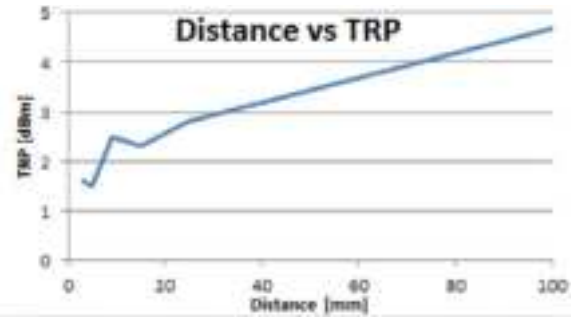

Figure 10 - TRP as a function of distance

Zigbee RF Signal Performance Recommendations

If a luminaire has a flat surface at the mounting location as shown below, the sensor can be installed without the need for an extra bracket; a knock-out must be available in such cases.

In general every dB drop reduces fixture to fixture distance by 1 meter. Figure 10 gives one reference measurement for Total Radiated Power (TRP) vs, distance from one side metal wall.

Wiring

Wire to Wire Connection

SNH211MC includes 18AWG wires, 60cm in length with 8mm strip length. A wire to wire connection can be made with connectors or wirenuts suitable for 18AWG solid wire.

The whire strip length in case of a wire to wire connection is connector dependent.

Wire to Driver Connection

A connection between the sensor and the driver should be made according to local practices. The SR/DA input wires of the EasySense for High Bay are not polarized for fixtures using one driver and ons sensor, and therefore can be connected, without taking care of polarity, to the SR/DA output of the driver - SR/DA+ and SR/DA- terminals. It is recommended to keep wire distance from sensor to driver less than 50 feet. Polarity must be maintained when connecting multiple drivers to one sensor.

The wire strip length in case of sensor to driver connection is approximately 8mm.

EasySense with Multiple Philips Xitanium SR LED Drivers (1:N Application)

When multiple drivers are used in a single luminaire, they can be controlled with a single sensor.

It is also possible to use one sensor to control multiple luminaires that need to be operated at the same level. In this case DALI drivers need to be connected to the sensor via an SR-bridge.

If a single sensor is connected to drivers in different luminaires without an SR bridge, the total cable length must not exceed 15 meters. 2-4 of the drivers must have SR power supply enabled.

EasySense sends commands to all connected drivers (using DALI broadcast command); it does not have capabilities for addressing individual drivers. The light commands are sent as a broadcast commands, so occupancy-/daylight-based lighting control and task tuning operate the same on all connected drivers. The readout of energy information from the driver will not function. Energy readout of multiple drivers is planned for future sensor FW generations.

FAQ

Is EasySense a DALI sensor?	EasySense cannot be used as a DALI input device in a DALI network with another DALI controller. EasySense (SNH212 MC) is an SR/D4i certified controller device with built-in sensors. It only works with Xitanium SR/D4i certified drivers or SR Bridges that use DALI protocol for communication.
Can I use one sensor with multiple luminaires?	Yes. Please refer EasySense with Multiple SR Drivers (1:N Application) section.
Can I use multiple sensors with a single driver?	No, EasySense is not intended to be used in a multi-master mode. In the typical 1:1 sensor to driver connection, a (single) EasySense is the master and an SR Driver is the slave. Adding multiple sensors on SR bus can lead to bus conflict and undesired functioning of the sensors.
Does EasySense make sense if I only want to do occupancy sensing?	Yes. Most occupancy sensors run on high voltage or require an extra power pack, adding cost and complexity. Typical wallplate-style occupancy sensors - while mass produced and inexpensive - vary in performance by use case since the viewing angle from a wall is less than ideal. Also, the relay-free operation of EasySense makes it inherently more reliable.
Is EasySense "failsafe"?	Unlike traditional occupancy sensors. EasySense does not have a mechanical relay. This is a benefit of Philips SR LED drivers, as on/off is done relay-free within the driver. Devices with mechanical relays should be designed so that relay failure results in "lights on." If an SR driver does not see a digital signal from a device for a long period of time (e.g., loose connection, sensor failure), the driver goes to full programmed output.
What are the differences between SNH21x MC and the predecessor SNH200?	SNH21x MC is commissioned via Bluetooth using Philips MasterConnect app, while SNH200 is commissioned via infrared with a dongle and Philips Field Apps. SNH21x MC does not have zone linking like SNH200 but shares occupancy between individual lights like SNH21x MC. Configuration via MultiOne is not possible. In contrast to SNH200, during commissioning lights don't dim down until the group is closed.

Contact Details

Product Information:
www.philips.com/easysense

Or contact your local Philips sales representative.

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Signify North America Corporation
400 Crossing Boulevard,
Bridgewater, NJ 08807
Telephone 855-486-2216

Signify Canada Ltd.
281 Hillmount Road,
Markham, ON, Canada L6C 2S3
Telephone 800-668-9008

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